



PROCEEDINGS  
OF THE  
BIOLOGICAL SOCIETY OF WASHINGTON

SEVEN NEW RATS COLLECTED BY DR. W. L.  
ABBOTT IN SIAM.\*

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Among the mammals collected by Dr. W. L. Abbott during a second expedition to Siam, and presented to the United States National Museum are seven large and medium sized species of *Mus*, all of which appear to be new. They were secured in the mountains of Trong, a small state subject to Siam and situated on the west side of the Malay Peninsula about 500 miles north of Singapore.

KEY TO THE RATS OF TRONG.†

Hind foot about 50 mm.; skull about 55 mm.

Tail much longer than head and body; back and sides strongly ochraceous.....*Mus vociferans*.

Tail about equal to head and body; back and sides not ochraceous.

Fur composed almost exclusively of fine, grooved bristles; ear longer than broad; general color above iron gray, beneath dull white.....*Mus ferreocanus*.

Fur composed almost exclusively of coarse hairs, with a very few slender grooved bristles intermixed; ear as broad as long; general color grizzled brown above, pale buff below.....*Mus validus*.

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†Exclusive of *Mus alexandrinus*.'

Hind foot less than 40 mm.; skull less than 45 mm.

Tail much longer than head and body, dark brown throughout.....*Mus cremoriventer*.

Tail about equal to head and body, bicolor.

Tail slightly shorter than head and body; hind foot less than 30 mm.; fur of belly dusky at base.....*Mus asper*.

Tail equal to or slightly longer than head and body; hind foot more than 30 mm.; fur of belly not dusky at base.

Nasals extending conspicuously behind nasal branches of premaxillaries; white of belly broadly continuous over lower leg with that of foot; general color dull ochraceous.....*Mus pella*x.

Nasals not extending behind nasal branches of premaxillaries; white of belly usually separated from that of foot by tawny inner surface of lower leg; general color bright ochraceous.....*Mus surifer*.

#### *Mus vociferans* sp. nov.

*Type* adult male (skin and skull) No. 86,736 United States National Museum, collected in the mountains of Trong, Lower Siam, at about 1000 ft. altitude, February 21, 1899.

*Characters*.—Similar to *Mus sabanus* Thomas of Borneo, but genera-size slightly greater and color apparently paler and brighter. Antorbital foramen less constricted below than in *M. sabanus* and with much wider outer wall. Region about posterior extremity of nasals less elevated. Molars relatively larger than in *Mus sabanus*.

*Fur*.—The fur is composed of three elements: (a) fine, somewhat wooly underfur, plumbeous on the back, white on the belly, (b) coarse terete hairs, and (c) grooved hairs or slender bristles. These all pass by in sensible gradations from one kind to another. On back the hairs and bristles are about 15 mm. in length. Those of rump are not elongated. On belly they are much shorter, scarcely exceeding 6 mm. Inner surface of legs free from bristles.

*Color*.—Back and sides ochraceous, everywhere sprinkled with black. The ground color is brightest on back and rump where it approaches orange ochraceous, and dullest on sides where it is very nearly raw sienna. The black is most conspicuous over lumbar region where it is somewhat in excess of the ochraceous. Further forward the two colors are about equally mixed. On sides the black is very inconspicuous. Top of head like back, but colors more finely mingled. Cheeks orange buff, very slightly sprinkled with buff posteriorly. Muzzle dull hair brown. Whiskers black. Belly and inner side of legs dull yellowish white to base of hairs; elsewhere the underfur is slate gray. Feet white, irregularly clouded with hair brown. Tail bicolor at base (dark brown above, whitish below) whitish throughout beyond middle.

*Tail*.—The long slender tail of *Mus vociferans* is coarsely, conspicuous

ly, and uniformly annulated. At middle there are only seven or eight rings to the centimeter. The rings are irregularly and inconspicuously marked by cross furrows dividing them into sharply rectangular scales longer than broad. Numerous stiff hairs spring from beneath the free edges of the rings, usually three to each scale. In length they scarcely exceed width of the rings, except near tip where they become longer and less stiff.

*Skull.*—The skull of *Mus vociferans* (Pls. III and IV, Fig. 3) is large, but in proportion to its size not very heavily built. In general appearance it differs only slightly from that of *M. sabanus*. On comparison it is seen to differ from that of the Bornean species in less robust rostrum, less elevated frontal region between roots of zygomata, and in the form of the antorbital foramen. This is smaller and more contracted, especially below, and the maxillary plate forming the outer wall is wider and less concave. The front edge of this plate is nearly straight, though slightly convex above. The audital bullæ like those of *Mus sabanus* are relatively very small, scarcely more than half as large as in *Mus decumanus*. By this character alone the species may be distinguished from the other large rats of the Malay Peninsula.

*Teeth.*—The teeth appear to agree in all respects with those of *Mus sabanus*, though I have seen none of the latter unworn. The enamel pattern is like that of *M. decumanus* except that there is no trace of rudimentary anterior outer tubercle often present in the second upper molar of the house rat. As in this species the posterior upper molar consists of an anterior inner tubercle followed by a crescentic loop with concavity directed inward. In unworn teeth this loop is normally complete, though in some specimens the posterior limb is divided by a furrow. With abrasion the limbs of the crescent become separated. Front surface of incisors deep orange.

*Measurements.*—External measurements of type: total length, 611; head and body, 229; tail vertebrae, 382; hind foot, 45 (43)\*; ear from meatus, 24; ear from crown, 19; width of ear, 18. Seven specimens (including type): total length, 566 (545-611); head and body, 224 (216-229); tail vertebrae, 342 (323-380); hind foot, 45 (42-48); hind foot without claw, 43 (40-46).

Cranial measurements of type: greatest length, 56; basal length, 47.6; basilar length, 44.6; palatal length, 25; least width of palate between anterior molars, 5; diastema, 14.8; length of incisive foramen, 8; combined breadth of incisive foramina, 3.8; length of nasals, 21.4; combined breadth of nasals, 6.2; zygomatic breadth, 25.8; interorbital breadth, 9; breadth of braincase above roots of zygomata, 20.4; mastoid breadth, 18.8; occipital depth at front of basioccipital, 14; frontopalatal depth at posterior extremity of nasals, 13.6; least depth of rostrum immediately behind incisors, 11; maxillary toothrow (alveoli), 11.8; width of front upper molar, 3; mandible, 30.6; mandibular toothrow (alveoli), 10.

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\*Measurement of hind foot in parenthesis is taken exclusive of claws.

*Specimens examined.*—Eight, all taken at or near the type locality.

*Remarks.*—*Mus vociferans* is the mainland representative of *M. sabanus*, a rat quite unlike any of the other species known to occur on the Malay Peninsula, and at present recorded from Borneo and the Natuna Islands only. It is a very noisy animal; when trapped its loud cries so quickly attract the smaller carnivores that perfect specimens are with difficulty obtained.

#### **Mus ferreocanus** sp. nov.

*Type* adult female (skin and skull) No. 86,737 United States National Museum, collected in the mountains of Trong, Lower Siam, at about 3000 ft. altitude, January 15, 1899.

*Characters.*—Size large (hind foot about 56; greatest length of skull, 53) tail slightly longer than head and body, dark brown at base, whitish at tip; ear long and narrow, its length greater than distance from eye to nostril; fur composed almost exclusively of fine grooved bristles; general color above bluish iron gray, beneath pure white; skull with slightly developed supraorbital ridges.

*Fur.*—Underfur rather scant, not at all woolly except on belly. The main body of the fur is composed of fine grooved bristles, those on middle of back about 15 mm. in length. Interspersed with the bristles are a few terete black hairs, 25-30 mm. in length. These are practically confined to the back and rump, and are nowhere conspicuous.

*Color.*—The color of this rat is difficult to describe with accuracy, as the tints cannot be matched in Ridgway's Manual of Colors. The general effect is a lustrous bluish iron gray, darker along middle of back, paler and slightly drab-tinged on sides; everywhere frosted by the pale glistening tips of the bristles, which produce a sheen varying much with different exposures to light. Cheeks washed with drab gray, muzzle with seal brown. Underparts creamy white, this color extending down inner side of front legs to wrists, and on hind legs nearly to ankles. Fur of dorsal surface gray (Ridgway, Pl. II, No. 8) at base, that of underparts white throughout. Ear dark brown; a small tuft of fine white hairs immediately beneath orifice. Tail dark brown, the terminal fourth dull white. Hind feet uniform sepia. Front feet sepia varied with dull white.

*Tail.*—The moderately long tail of this species is finely, inconspicuously and somewhat irregularly annulated. At middle there are twelve rings to the centimeter. The rings are divided by cross furrows into scales longer than broad and with rounded corners. These scales, however, are scarcely noticeable to the unaided eye. The fine stiff hairs that spring from the spaces between the rings are in length about one half greater than width of ring, and are apparently not definitely arranged with regard to the scales. Near tip of tail the rings become narrower and more indefinite and the hairs longer and less stiff, though without forming any semblance of a pencil.

*Skull.*—The skull of *Mus ferreocanus* (Pls. III and IV, Fig. 2) though of the same general size as that of the other large rats of Trong, is easily recognizable by its shallow, weak rostrum and tapering form as well as by various details in structure. The zygomata are strongly convergent anteriorly, their anterior roots relatively light and little spreading. Antiorbital foramina small, but less contracted below than in the other species. The plate forming its outer wall is faintly concave on the outer surface, its anterior border slightly convex from below middle, the straight portion at base *sloping distinctly backward*. Pterygoids long and straight to the extreme tip, the interpterygoid space *narrowing gradually and continuously* from behind forward. Audital bullæ much larger than in *Mus vociferans*, but not peculiar in form. Interorbital region narrow. Supraorbital ridges low and little developed, much as in *Mus bowersi*, but traceable along sides of braincase to lambdoid ridge.

*Teeth.*—Molars slightly narrower than in *Mus vociferans*, the enamel folds relatively broader, but not essentially different in form. The posterior limb of the terminal crescent in the third upper molar is normally divided from the anterior, even in unworn teeth. Lower molars differing in much the same manner as the upper. Incisors relatively weak, their anterior face *yellowish white*.

*Measurements.*—External measurements of type specimen: total length, 489; head and body, 238; tail vertebræ, 251; hind foot, 56 (53); ear from meatus, 27; ear from crown, 21; width of ear, 17. A second adult specimen: total length, 501; head and body, 241; tail vertebræ, 260; hind foot, 56 (53).

Cranial measurements of type: greatest length, 53.6; basal length 48; basilar length, 45; palatal length, 25; least width of palate between anterior molars, 5; diastema, 15.8; length of incisive foramen, 9.4; combined breadth of incisive foramina, 3.8; length of nasals, 22.6; combined breadth of nasals, 5.2; zygomatic breadth, 25.4; interorbital breadth, 8; mastoid breadth, 20.2; breadth of braincase above roots of zygomata, 20; depth of braincase at anterior extremity of basioccipital, 14.6; frontopalatal depth at posterior extremity of nasals, 12; least depth of rostrum immediately behind incisors, 8; maxillary toothrow (alveoli), 9.4; width of front upper molar, 2.8; mandible, 30; mandibular toothrow (alveoli), 9.

*Specimens examined.*—Three, all from the type locality.

*Remarks.*—This species is not closely related to the other rats of the Malay Peninsula; and I am unable to find any description of an animal at all resembling it among the forms occurring in the East Indian Archipelago.

#### *Mus validus* sp. nov.

*Type* adult male (skin and skull) No. 86,741 United States National Museum, collected in the mountains of Trong, Lower Siam, at about 1000 ft. altitude, February 18, 1899.

*Characters.*—A large robust animal in size and general appearance resembling *Mus bowersi* Anderson from Burmah. Fur coarse, but essen-

tially spineless. Tail about as long as head and body, dark brown throughout, its annulation more coarse than in *M. bowersi*. Ear short and broad, its length less than distance from eye to nostril. Skull and teeth much heavier than in the Burmese species, the rostrum shorter, broader and deeper, and supraorbital ridges remarkably heavy. *Enamel pattern of third upper molar essentially like that of second, and both with well developed antero-external tubercle.*

*Fur.*—Although the fur is composed of the usual three kinds of hair the bristles are so slender that to the unaided eye their true nature is not apparent. They average about 30 mm. in length on the back, while the terete hairs are little more than half as long.

*Color.*—Back and sides a fine grizzle of black and dull buff (slightly browner than Ridgway, Pl. V, No. 13), the two colors nearly equally mixed on back, but the black hairs much less abundant on sides, where the buff is somewhat dulled by the irregular appearance at the surface of the gray (Ridgway, Pl. II, No. 7) underfur. Underparts cream buff to base of hairs, this color extending down inner surface of legs to wrists and nearly to ankles. Feet scantily clothed with short sepia hairs. Head like back, but the colors more closely blended. Cheeks like sides. Muzzle hair brown. Ears and tail dark brown, the latter without trace of paler tip.

*Tail*—The moderately long tail is coarsely conspicuous and uniformly annulated. At middle there are about  $9\frac{1}{2}$  rings to the centimeter. The rings are noticeably divided by cross furrows into scales slightly longer than broad, the distal edges of which are crenulate. Numerous stiff black hairs spring from beneath the free edges of the rings, usually three to each scale. In length the hairs about equal the width of the rings. At tip of tail the rings become closer and the hairs longer and less stiff but without forming a pencil.

*Skull.*—The skull of *Mus validus* (Pls. III and IV, Fig. 1) differs more widely from that of *M. bowersi* (Pls. III and IV, Fig. 4) than could be anticipated from the external similarity of the two animals.\* The latter in fact bears a superficial resemblance to the skull of *Mus vociferans*, differing chiefly in its more slender rostrum, larger audital bullæ, more convergent zygomata, and obsolete supraorbital ridges, characters all but one of which are directly the opposite to those of *Mus validus*. Supra-orbital ridges very prominent, and forming a distinct postorbital angle, behind which they are continued backward along sides of braincase to extremities of interparietal. The lower portion of the antorbital foramen, widely open in *Mus bowersi*, is here reduced to a mere slit, partly as the result of shortness of rostrum and consequent unusually close contiguity of root of incisor and anterior edge of outer wall of foramen. The plate forming this outer wall is broad, its outer surface distinctly concave. Anterior border strongly convex from a little below middle,

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\*For the opportunity to examine a specimen of *Mus bowersi* collected by Fea at Yado, Burmah, I am indebted to Dr. R. Gestro, of the Genoa Museum.

the basal straight portion directed *slightly forward*. Audital bullæ smaller than in *Mus bowersi*, though nearly double as large as in *M. vociferans*, subcircular in outline when viewed from the side.

*Teeth*.—The teeth are broader than in the other large rats from Trong, but the toothrow as a whole is not correspondingly lengthened. Enamel pattern of first upper molar as in *Mus decumanus*. In the second tooth a small but distinct antero-external tubercle is added to the number normally present.\* Occasionally this tubercle is connected with that of opposite side, so that the enamel pattern consists of three transverse folds as in the first tooth. Third molar like second, though smaller, and the elements of the tooth less distinct. This tooth is therefore of more complicated structure than that of *Mus decumanus*, owing to the addition of an anterior outer tubercle, and the normal division of the posterior crescent into two transverse loops.

*Measurements*.—External measurements of type: total length, 521; head and body, 254; tail vertebræ, 267; hind foot, 49 (46); ear from meatus, 20.6; ear from crown, 16; width of ear, 16. Another specimen, also a male: total length, 515; head and body, 248; tail vertebræ, 267; hind foot, 52 (49).

Cranial measurements of type: greatest length, 55; basal length, 48.6; basilar length, 45.6; palatal length, 26; least width of palate between anterior molars, 5; diastema, 14.6; length of incisive foramen, 9; combined breadth of incisive foramina, 3.6; length of nasals, 22.6; combined breadth of nasals, 6.2; zygomatic breadth, 28; interorbital breadth, 8; mastoid breadth, 19; breadth of braincase above roots of zygoma, 20; depth of braincase at anterior border of basioccipital, 15; fronto-palatal depth at posterior extremity of nasals, 13.4; least depth of rostrum immediately behind incisors, 10; maxillary toothrow (alveoli), 11; width of front upper molars, 3; mandible, 31; mandibular toothrow (alveoli), 10.

*Specimens examined*.—Two, both from the type locality.

*Remarks*.—Though this rat bears a strong superficial resemblance to *Mus bowersi* its skull and teeth show that there is no very close relationship between the two animals. Probably the Siamese animal is more nearly related to the Bornean *Mus infraluteus* Thomas. This species, which is slightly larger than *Mus validus*, and with actually as well as relatively shorter tail, differs from it further in darker general color, and in the dark underfur of the ventral surface. The skull is shorter and apparently broader, and the incisive foramina do not extend back to line of front of molars. The palate is said to be 32 mm. in length, while in *M. validus* it is only 26 mm. In the original description of *Mus infraluteus* the enamel pattern is not mentioned. It is therefore presumably normal and quite different from that of *M. validus*.

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\*A trace of this tubercle is usually visible close to the cingulum in *Mus decumanus*, but forming no part of the triturating surface of the crown.

**Mus cremoriventer** sp. nov.

*Type* adult male (skin and skull) No. 86,770 United States National Museum, collected in the mountains of Trong, Lower Siam, at about 3000 ft. altitude, January 16, 1899.

*Characters*.—A slender animal about the size of *Mus jerdoni* Blyth, from Mount Mooleyit, Burmah. Tail much longer than head and body, *dark brown throughout, thinly but distinctly penicillate*. Fur very thickly spinous. General color dull ochraceous above, whitish cream buff beneath. Skull shorter and relatively broader than that of *M. jerdoni*.

*Fur*.—As in *Mus jerdoni* the fur of the back and sides is composed of three kinds of hair, (a) soft fine underfur about 10 mm. in length, light gray at base and ochraceous at tip, (b) broad, grooved bristles slightly longer than the underfur, light horn color at base, those on back blackish at tip, those on sides uniform throughout, and (c) slender terete hairs 20 mm. in length, blackish throughout, but darker at tip than at base. The long hairs are rather abundant on back, most numerous posteriorly. On sides they soon disappear. On belly the bristles and underfur alone are present, both much reduced in length, and without dark bases. Legs nearly free from bristles except on outer side.

*Color*.—General color above dull ochraceous fading to ochraceous buff or dull buff yellow on sides, the sides nearly clear, but back, shoulders, neck and head uniformly sprinkled with black-tipped hairs and bristles which are nowhere in excess of the ochraceous. Cheeks clear ochraceous buff. Muzzle hair brown, paler at the sides. A narrow dark shade encircles each eye but without forming a distinct eyering. Underparts and inner surface of legs clear light cream buff to base of hairs, sharply defined and extending to wrists and ankles. Feet mixed whitish and sepia. Tail and naked ears uniform dark brown throughout.

*Tail*.—The slender tail is conspicuously and regularly annulated. At middle there are 11 or 12 rings to the centimeter. The rings are sharply marked off from each other, and so slightly divided by cross furrows that to the unaided eye they appear entire. With a lens they are seen to be made up of rectangular scales slightly longer than broad. The free edges of the rings are slightly crenulate and from beneath them spring stiff black hairs whose length slightly exceeds width of rings. There are usually three hairs to each division of the ring. Toward tip the rings become much narrower and the hairs longer, forming a thin but evident pencil.

*Skull*.—The skull of *Mus cremoriventer* (Pl. V, Fig. 2) is shorter and broader than that of *M. jerdoni* (Pl. V, Fig. 1). Its reduction in length is due more to shortening of the rostrum than of the braincase, so that the form of the skull is sensibly altered. Incisive foramina shorter and relatively broader than in *Mus jerdoni*, their posterior extremity on level with front of first molar. Antorbital foramen smaller than in *Mus jerdoni* but less contracted below. The maxillary plate forming its outer wall is narrow, the greatest width only 2.8 mm. Its anterior border is faintly concave below and faintly convex above, the general slope uni-



formly backward. Zygomata light though less slender than in *M. jerdoni*, not abruptly flaring anteriorly. Supraorbital ridges well developed and continued backward to interparietal, but not forming a distinct postorbital angle.

*Teeth.*—The teeth agree closely with those of *Mus jerdoni*. Arrangement of molar tubercles as in *M. jerdoni* and *M. decumanus*. Anterior face of incisors bright orange, the upper somewhat darker than the lower.

*Measurements.*—External measurements of type: total length, 317; head and body, 146; tail vertebrae, 171; pencil, 8; hind foot, 30 (28.5)?;\* ear from meatus, 17; ear from crown, 13; width of ear, 12. A second specimen: total length, 305; head and body, 130; tail vertebrae, 175; hind foot, 30 (28.5)?\*

Cranial measurements of type: greatest length, 34; basal length, 28; basilar length, 25; palatal length, 13.4; least width of palate between anterior molars, 3.4; diastema, 8.2; length of incisive foramen, 5.6; combined breadth of incisive foramina, 2.6; length of nasals, 11.8; combined breadth of nasals, 4; zygomatic breadth, 15.4; interorbital breadth, 6; mastoid breadth, 12.8; breadth of braincase over roots of zygomata, 14.8; depth of braincase at front of basioccipital, 10; fronto-palatal depth at posterior extremity of nasals, 7; least depth of rostrum immediately behind incisors, 6; maxillary toothrow (alveoli), 6; width of front upper molar, 1.6; mandible, 15.6; mandibular toothrow (alveoli), 6.

*Specimens examined.*—Two, both from the type locality.

*Remarks.*—*Mus cremoriventer* differs too widely from the other species known to occur on the Malay Peninsula to require any special comparison. It is immediately recognizable by its moderate size, slender form, spiny fur, and long, unicolor, slightly penicillate tail.

#### *Mus asper* sp. nov.

*Type* adult female (skin and skull) No. 86,767 United States National Museum, collected in the mountains of Trong, Lower Siam, at an altitude of about 1000 ft., February 2, 1899.

*Characters.*—Smaller than *Mus jerdoni* (hind foot about 28 mm). Tail shorter than head and body, bicolor, but not white at tip. Fur of back very densely set with stiff bristles. General color raw sienna above, dull buff beneath, the fur everywhere dusky at base; a tawny spot on chest. Skull relatively broader than in *Mus jerdoni* or *M. cremoriventer*, the anterior portion of the zygomata more abruptly flaring and whole arch disproportionately heavy.

*Fur.*—The fur is as in *Mus jerdoni* and *M. cremoriventer*, except that the spines are more abundant on back and less numerous on sides and belly. Back with very few long terete hairs. Legs wholly free from bristles.

*Color.*—General color above raw sienna (slightly paler than Ridgway, Pl. V, Fig. 2) fading to light ochraceous on sides. Back, shoulders, neck, and head uniformly clouded or speckled with bister; this and the raw

\*Distorted in preparation; measurement probably too long.

sienna present in about equal quantities. Bister soon disappearing on sides and cheeks. Muzzle hair brown, grayish at sides. A dark shade about eye. Underparts dull buff, sharply defined, much darker and browner than in *M. cremoriventer*, fading to buffy gray on chin and inner side of legs, down which it extends to join dull white of feet. A small tawny spot on middle of chest. *Fur of underparts everywhere conspicuously dusky at base.*

*Tail.*—Except for its shortness the tail is essentially like that of *M. cremoriventer*. The annulation, however, is a little less distinct, and the rings are more noticeably divided by cross furrows. In none of the specimens is the tail perfect to extreme tip, but there is no apparent tendency to form a pencil.

*Skull.*—The skull of *Mus asper* (Pl. V, Fig. 3) while of about the same length as that of *Mus jerdoni* (Pl. V, Fig. 1) differs conspicuously in the deeper rostrum, strongly cuneate nasals, larger antorbital foramen, heavier, more abruptly flaring and more depressed zygomata, and larger, strongly angled supraorbital ridges. Incisive foramina short and broad, their outer margins convergent anteriorly. Interpterygoid space shorter and wider than in *Mus jerdoni*. Plate forming outer wall of antorbital foramen essentially as in *Mus cremoriventer*, and distinctly less convex above than in *Mus jerdoni*.

*Teeth.*—The teeth appear to be precisely like those of *Mus jerdoni*.

*Measurements.*—External measurements of type: total length, 254; head and body, 133; tail vertebrae, 121; hind foot, 27 (25.5); ear from meatus, 18; ear from crown, 13; width of ear, 14. An adult male from the type locality: total length, 235; head and body, 121; tail vertebrae, 114; hind foot, 28 (26.5). The hind foot in two specimens in alcohol measures respectively, 28.6 (27.4) and 26 (25).

Cranial measurements of type; greatest length, 34; basal length, 28; basilar length, 26; palatal length, 13.4; least width of palate between anterior molars, 3.6; diastema, 8.4; length of incisive foramen, 4.6; combined breadth of incisive foramina, 2.8; length of nasals, 11; combined breadth of nasals, 3.8; zygomatic breadth, 15.4; interorbital breadth, 5.8; mastoid breadth, 11.8; breadth of braincase above roots of zygomata, 13.6; depth of braincase at front of basioccipital, 9.8; frontopalatal depth at posterior extremity of nasals, 8; least depth immediately behind incisors, 6; maxillary toothrow (alveoli), 6; width of first upper molar, 1.4; mandible, 17.2; mandibular toothrow (alveoli), 5.4.

*Specimens examined.*—Six (two in alcohol), all from the type locality.

*Remarks.*—While *Mus asper* differs widely from the known mainland representatives of the genus it is probably rather closely related to the Bornean *Mus whiteheadi* Thomas, a species which I know by description only. *Mus asper* agrees with the Bornean animal in size, character of fur, color scheme, and general aspect of skull, but differs from it in its shorter tail, lighter color with stronger contrast between sides and belly, less developed maxillary plate forming outer wall of antorbital foramen; relatively wider incisive foramina, and apparently longer molar row.

*Mus pellax* sp. nov.

*Type* adult female (skin and skull) No. 86,755 United States National Museum, collected in the mountains of Trong, Lower Siam, at an altitude of about 1000 ft., February 5, 1899.

*Characters*.—Closely related to *Mus jerdoni* Blyth from Mount Mooleyit, Burmah, but with larger skull and teeth, much shorter incisive foramina and relatively smaller audital bullæ. *Nasals extending conspicuously behind nasal branches of premaxillaries*. White of inner side of thigh continued along lower leg to join that of foot, as in *Mus jerdoni*.

*Fur*.—The fur is as in *Mus jerdoni* and *M. cremoricenter*.

*Color*.—Back and sides clay color tinged with ochraceous, particularly on shoulders and flanks, and everywhere darkened by mixture of Vandyke brown, the latter in excess over middle of back, nearly disappearing on sides. Underparts white, sharply defined, this color extending down inner side of legs and covering dorsal surface of feet. Muzzle hair brown. Face and crown like back. An ill defined brown eyering. Between ears there is a conspicuous elongate white spot, possibly due to albinism. Ears dark brown. Tail bicolor, but not sharply so, light brown above, whitish below, the colors becoming indefinite near tip.

*Tail*.—The tail is indistinctly annulated; ten rings to the centimeter at middle. The rings are not sharply defined. Each is divided into segments distinctly broader than long. From beneath the free edges of the rings grows numerous hairs whose length about equals width of two rings. These hairs are not definitely arranged, and from one to four spring from each section. At tip the rings become very irregular, but the hairs, contrary to the general rule, are reduced in length.

*Skull*.—Though noticeably larger than that of *Mus jerdoni* the skull of *Mus pellax* does not differ from it in general form. The audital bullæ are a shade smaller than in *Mus jerdoni*, therefore relatively of much less size. Incisive foramina short and broad, the outer margins converging anteriorly. Nasals extending nearly 3 mm. behind nasal branches of premaxillaries. At anterior extremity each nasal is emarginated on outer side so that the two together form a narrow median point. Otherwise the skull agrees with that of *Mus jerdoni*.

*Teeth*.—The teeth are much broader than those of *Mus jerdoni*. Enamel pattern as in *M. jerdoni* and *M. decumanus* except in the presence of a minute supplemental tubercle between first and second tubercles on inner side of second upper molar. Though present and perfectly symmetrical in the tooth of each side it is probably not a normal character.

*Measurements*.—External measurements of type: total length, 317; head and body, 152; tail vertebrae, 165; hind foot, 35 (33); ear from meatus, 21; ear from crown, 16; width of ear, 17.

Cranial measurements of type: greatest length, 41; basal length, 34; basilar length, 31; palatal length, 17; least width of palate between anterior molars, 4; diastema, 11.5; length of incisive foramen, 6; combined breadth of incisive foramina, 3; length of nasals, 16; combined breadth of nasals, 4.8; zygomatic breadth, 18; interorbital breadth, 6.4; mastoid

breadth, 14; breadth of braincase above roots of zygomata, 16; depth of braincase at front of basioccipital, 10.8; fronto-palatal depth at posterior extremity of nasals, 8.8; least depth immediately behind incisors, 7; maxillary toothrow (alveoli), 6.8; width of first upper molar, 2; mandible, 21.5; mandibular toothrow (alveoli), 6.5.

*Specimens examined*.—One, the type.

*Remarks*.—While this species is very distinct from *Mus jerdoni*, its relationship to *Mus surifer* is questionable. Dr. Abbott writes that he examined numerous individuals and that in the flesh they could be invariably distinguished from the species with which they were associated. The white spot on the head he regards as a normal character.

#### *Mus surifer* sp. nov.

*Type* adult male (skin and skull) No. 86,746 United States National Museum, collected in the mountain of Trong, Lower Siam, at an altitude of about 3,000 feet, January 14, 1899.

*Characters*.—In general appearance much like *Mus jerdoni* and *M. pellax*, but larger and more robust than either. Fur thickly spiny. Tail about equal to head and body, though usually somewhat longer, bicolor with exception of terminal third or fourth, which is entirely dull white. *Hind leg from knee to heel usually ochraceous on both sides* thus separating white of inner side of thigh from that of foot. Skull much larger and more conspicuously ridged than that of *Mus jerdoni*.

*Fur*.—The fur is as in *Mus jerdoni* and *M. cremoricenter*.

*Color*.—Upper parts uniform tawny ochraceous, heavily sprinkled with blackish brown on posterior half of back, less so on shoulders and head. Sides, flanks, cheeks and outer surface of legs clear tawny ochraceous. Underparts white to base of hairs. The white extends down inner sides of front legs to wrists, but on hind legs it normally reaches barely beyond knee, below which the entire leg is ochraceous, though slightly dulled on inner side by the dusky bases of the hairs. Occasionally, however, the white extends in a narrow irregular line to heel. Feet dull white. Ears and dorsal surface of tail to terminal third or fourth dark brown. Underside of tail and whole of terminal third or fourth dull white.

*Tail*.—The tail is distinctly annulated, though less evenly than in *Mus cremoricenter*. There are about 12 rings to the centimeter at middle. The rings are indistinctly divided into sections slightly longer than broad, from the free edge of each of which spring 1-3 hairs equal in length to width of about one and one half rings. At tip the rings become narrower and less regular, the hairs at the same time increasing in abundance, but not in length, and not forming a pencil.

*Skull*.—The skull of *Mus surifer* (Pl. V, Fig. 4) is conspicuously larger than that of *M. jerdoni* (Pl. V, Fig. 1), though not very different in form. Supraorbital ridges high and continued backward to interparietal, and in old individuals forming a strong postorbital angle. Incisive foramina relatively much shorter and wider than in *Mus jerdoni*, distinctly wider posteriorly than anteriorly.

*Teeth.*—The teeth are relatively broader than in *Mus jerdoni*, but in structure they show no peculiarities.

*Measurements.*—External measurements of type: total length, 400; head and body, 197; tail, 203; hind foot, 38 (36); ear from meatus, 21.5; ear from crown, 18; width of ear, 15. Ten specimens (five of each sex) from the type locality average: total length, 372 (356-400); head and body, 187 (162-197); tail vertebræ, 185.5 (175-203); hind foot, 38.6 (36-40); hind foot without claws, 35.8 (34-39).

Cranial measurements of type: greatest length 46 (36.6)\*; basal length, 40 (30); basilar length, 37 (27.6); palatal length, 19 (14.8); least width of palate between anterior molars, 4.6 (3.8); diastema, 13.4 (9.4); length of incisive foramen, 7.4 (6.6); combined breadth of incisive foramina, 4 (3); length of nasals, 18.6 (14); combined breadth of nasals, 5 (3.6); zygomatic breadth, 19.8 (15.4); interorbital breadth, 7.6 (6); mastoid breadth, 15 (13); breadth of braincase above roots of zygomatic, 16 (15); depth of braincase at front of basioccipital, 12 (10.4); frontopalatal depth at posterior extremity of nasals, 9 (8); least depth of rostrum immediately behind incisors, 8 (6.8); maxillary toothrow (alveoli), 7 (6); width of front upper molar, 2 (1.6); mandible, 24.6 (18.6); mandibular molar series (alveoli), 7 (5.8).

*Specimens examined.*—Twenty-one, all from the type locality.

*Remarks.*—*Mus surifer* is somewhat closely related to *Mus jerdoni*, though immediately distinguishable by its much greater size. Two adult specimens of the latter measure: total length, 325 and 322; head and body, 200 and 192; tail vertebræ, 125 and 130; hind foot, 31.5 (30.5) and 30.5 (29.5); ear from meatus, 19 and 19; ear from crown, 16 and 16; width of ear, 14 and 13. Externally *Mus surifer* is probably much like the Bornean *Mus rajah* Thomas; but the skull is considerably smaller. Some of the cranial measurements of the type of *Mus rajah* are: greatest length, 51; basilar length, 41; zygomatic breadth, 22; nasals, 19; diastema 14.5

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\*Measurements in parenthesis are those of an adult specimen of *Mus jerdoni* from Mount Mooleyit, Burmah.

## EXPLANATION OF PLATES.

(All figures slightly less than natural size.)

## PLATES III AND IV.

- Fig. 1. *Mus validus*. Type.  
Fig. 2. *Mus ferreocanus*. Type.  
Fig. 3. *Mus vociferans*. Type.  
Fig. 4. *Mus bowersi*. Adult male, Yado, Burmah (Genoa Museum).

## PLATE V.

- Fig. 1. *Mus jerdoni*. Adult female No. 101,520, United States National Museum. Mount Mooleyit, Burmah.  
Fig. 2. *Mus cremoricenter*. Type.  
Fig. 3. *Mus asper*. Type.  
Fig. 4. *Mus surifer*. Topotype. No. 86,760, United States National Museum. (A much younger specimen than that of *M. jerdoni*.)